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UNITED STATES GOVERNMENT

Memorandum

Department of Agriculture—Forest Service
P. O. Box 3623
Portland, Oregon 97208

TO : The Record

File No. 5200

FROM : Stanley W. Meso

Date: January 13, 1966

SUBJECT: Forest Insect Control (Balsam Woolly Aphid Trend Plot Study--Crater Lake National Park)

Your reference:

Primary reason for establishment of balsam woolly aphid trend plots at Crater Lake National Park is to determine susceptibility and rate of mortality to aphid feeding of Abies species other than A. lasiocarpa, subalpine fir. Secondary purposes include studies to observe branch gouting intensities, to investigate persistence of bole infestations, and to confirm percentage of fir mortality by species and crown class before infestations collapse.

Research

Three trend plot areas were selected and established in 1964 by Paul Buffam. One hundred trees were tagged and infestation data recorded at Copeland, Trapper, and Red Blanket Creeks. These trend plot areas were inspected on November 8 and 9, 1965. Tree infestation data were recorded with the help of assistant Park Rangers, John Chapman and George Henly. Park Forester, Clyde Fauley, accompanied us to the Copeland Creek plot where he helped with data collection and familiarized himself with balsam woolly aphid infestation characteristics.

Copeland Creek Plot--The northernmost plot at Copeland Creek sustains the heaviest aphid infestation. Subalpine fir comprises 62 percent of this plot while the remaining 38 percent is Shasta red fir, Abies magnifica, and/or A. magnifica shastensis. Table 1 summarizes crown class composition by percent of species. In 1964, 95 percent of the subalpine firs were found to support infestations ranging from light to heavy. Aphid attack intensity breakdown is as follows: 79 percent heavily infested, six percent moderately infested, and ten percent were classed as lightly infested. Twenty-one percent of the Shasta red firs were rated as maintaining light infestations.

Actually based on insects seen -or damage ?

Tree mortality from September 1964 to November 1965 was confined mainly to co-dominant and intermediate subalpine fir crown classifications. Percent of mortality (Table 1) appears to be closely associated with percent of crown class composition. Nearly equal numbers of trees occurred in the two middle crown classes and tree mortality was also equal in these two classes. Twenty-nine percent of trees in each classification died. Array of dead tree diameters at breast height, ranged from 4 to 11 inches. However, no significant grouping in one particular diameter class was found. Mortality distribution was surprisingly uniform. One tree was dead in the

meaning ?

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4-inch diameter class, three in the 5-inch class, and four in the 6-inch class. Two dead trees occurred in each of the other diameter classes. Suppressed trees, 5-inch diameter class, are passing out of the plot. It is premature to form conclusions about aphid-infested subalpine fir mortality trend resulting from aphid damage. Shasta red fir is surviving but could it be the result of dominant and co-dominant advantages of the species in the stand?

Table 1.--Copeland Creek plot crown class composition of 100 trees by species

	Crown class				
	Dominant	Co-dominant	Intermediate	Suppressed	Total
	Percent				
Subalpine fir	5	28	26	3	62
Shasta red fir	19	15	4	0	38
1965 mortality by crown class					
	Percent				
Subalpine fir	0	8	8	2	18
Shasta red fir	0	0	0	0	0

Trappers Creek Plot--This plot, located about 5 miles southwest of Copeland Creek, is outside the main aphid infestation area. Infestation density appears to diminish considerably with distance south of Copeland Creek. Stand composition at this plot by species is similar to Copeland Creek. Subalpine fir is the predominant species comprising 64 percent of the stand; Shasta red fir makes up the remaining 36 percent (Table 2). Subalpine fir tree crown class composition is broader than in the northern plot. There is good tree number representation in the intermediate through the dominant class. Majority of the Shasta red fir crown classes fall in the intermediate and dominant categories. Aphid infestation intensities at Trappers Creek were light in 1964. Population levels were low with 15 percent of subalpine firs heavily infested, 4 percent moderately infested, and 3 percent lightly infested. No aphid activity was found on Shasta red firs.

Tree mortality for subalpine fir was low at Trappers Creek. Fourteen percent of the dominant trees, 13 percent of the co-dominant, and five percent of the intermediate trees died. No mortality grouping occurred in any particular

diameter class. One dead tree was contained in each of the 7-, 10-, 11- and 15-inch diameter classes and two trees in the 13-inch class were dead. Suppressed trees are still surviving with no evidence of aphid activity.

Table 2.--Trappers Creek plot crown class composition of 100 trees by species

	Crown class				
	Dominant	Co-dominant	Intermediate	Suppressed	Total
	-Percent				
Subalpine fir	21	16	21	6	64
Shasta red fir	17	4	14	1	36
1965 mortality by crown class					
	-Percent				
Subalpine fir	3	2	1	0	6
Shasta red fir	0	0	0	0	0

Red Blanket Creek--The southernmost plot is located at Red Blanket Creek. This area is situated centrally approximately one mile north of the southern park boundary. Tree species composition is predominantly Shasta red fir. Composition on the plot is 71 percent Shasta red fir and 29 percent subalpine fir. No aphid activity was detected at this plot in 1964 or 1965. Table 3 summarizes plot crown classifications.

Table 3.--Red Blanket Creek plot crown class composition of 100 trees by species

	Crown class				
	Dominant	Co-dominant	Intermediate	Suppressed	Total
	-Percent				
Subalpine fir	7	12	10	0	29
Shasta red fir	22	30	19	0	71

Meaningful data are being accumulated at the three plots. These plots will yield information about tree mortality trend and will also indicate extent of balsam woolly aphid spread and population densities within the Park. Tree mortality could be following a predicted trend by species, but a single season's observation is not sufficient to confirm the possibility of Shasta red fir resistance to balsam woolly aphid attack. Both bole infestation persistence and branch gouting were not very apparent in 1965. This could be attributed to lack of training rather than aphid activity.

aphids?

In response to requests by John Chapman and George Henley for additional information, the literature below will be sent. Unfortunately, there are not enough copies available to supply the needs of everyone.

The literature sent includes the following:

Anonymous. The balsam woolly aphid Chermes piceae (Ratz.)

Buffam, 1964. Establishment report Chermes trend plots in Crater Lake National Park, Oregon.

Doerksen and Mitchell, 1965. Effects of the balsam woolly aphid upon wood anatomy of some western true firs.

Johnson and Wright, 1957. The balsam woolly aphid problem in Oregon and Washington.

Johnson, Mitchell and Wright, 1963. Mortality and damage to Pacific silver fir by the balsam woolly aphid in southwestern Washington.

Wright and Johnson, 1957. Chermes threaten northwest white fir forest.

Stanley W. Buffam

SWMeso:ec

cc: Crater Lake N.P. with literature
John Mahoney, Park Service, San Francisco
Rogue River N.F.
Russ Mitchell, PNW
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